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BRIEFER ARTICLES

APOGAMY IN PHEGopteris POLYPODIOIDES FEE, OSMUNDA CINNAMOMEA L., AND O. CLAYTONIANA L.

Apogamous embryos developed on prothallia of *Phegopteris polypodioides* Fée, *Osmunda cinnamomea* L., and *O. Claytoniana* L. in cultures on Prantl's and Knop's full solutions and certain modifications of the Prantl's solution. About 6 months after the spores had been sown, the first cases of apogamy were observed in cultures of *Phegopteris polypodioides* on Prantl's solution with NH_4NO_3 omitted. The spores from which the prothallia developed had been collected during the summer from a plant growing on a lawn in Ithaca, New York. The plant did not appear in a normal, healthy condition, doubtless owing to the unfavorable conditions under which it was growing. After the spores were sown upon the nutrient solutions, the cultures were placed before an east window, where the conditions of light and temperature were approximately the same for all. Once each week the prothallia were transferred to fresh nutrient solutions.

The prothallia, upon which the apogamous embryos developed, were heart-shaped and developed archegonia but no antheridia. The apogamous embryo in most cases originated as a slight swelling of the archegonial cushion, either on the dorsal or ventral side, at some point near the notch or at the center of the cushion. This swelling gradually increased until a dome-shaped cellular mass was formed, from which the apogamous embryo developed. The parts of the embryo usually appeared in the following order: the leaf or leaves, root, and stem. However, in one case a root appeared before any other member. No foot was formed. In some cases, beside leaves, proliferations, either filamentous or slightly expanded at the apices, developed from the cellular mass. October 7, 1916, two series of cultures on the Prantl's and Knop's full nutrient solutions and modifications of the Prantl's solution were made. Fresh spores from the same plant at Ithaca, New York, as well as spores of the same species secured through the kindness of Dr. A. H. GRAVES from Brooklin, Maine, were used. As soon as the spores were sown upon the nutrient solutions, one series was placed in the greenhouse in bright light, while the other series was kept in the laboratory before an east window. The prothallia were not transferred to fresh solutions, but

were allowed to remain upon the original solution on which the spores had been sown. A luxuriant growth of algae developed in all of the cultures, which added to the unfavorable growing conditions.

March 9, 1917, in both series of cultures, apogamous embryos were observed on the prothallia which developed in Knop's full solution from spores collected in Maine. Archegonia were developed on many of the heart-shaped prothallia, while in some of the cultures on the smaller prothallia antheridia were present. Some of the archegonia appeared aborted. In most cases the apogamous embryos developed in the manner which has previously been described. However, a few cases of peculiar development were observed. Multicellular hairs or outgrowths formed at the base of the first leaf or leaves of the young sporophyte, or at various places on it.

On one prothallium a long cylindrical outgrowth several cells in thickness developed from the cellular mass along with the leaves of the apogamous sporophyte. As growth proceeded, this outgrowth broadened out into a one-celled prothallium-like structure, after which it again assumed the cylindrical shape bearing tracheids; at its apex it tended to return to the prothallium structure. On another prothallium an outgrowth which had developed from the notch of the prothallium and projected as a narrow process broadened at the apex, forming a slightly notched prothallium.

The only cases of apogamy on prothallia developed from spores collected at Ithaca, New York, occurred in the culture of Knop's full solution which had been kept in the laboratory. Most of the apogamous embryos originated from cellular masses formed on the prothallia, but on one prothallium a cylindrical outgrowth bearing tracheids developed from the cells in the notch. At the apex of this long cylindrical process a cellular mass was formed, from which the leaves, root, and stem of the apogamous embryo developed.

Two series of cultures of *Osmunda cinnamomea* and *O. Claytoniana* were made at the same time, in the same manner, and placed under the same conditions as the cultures of *Phegopteris polypodioides*. Apogamous embryos were observed March 9, 1917, on the prothallia in the following solutions: Prantl's full solution, Prantl's solution with NH_4NO_3 omitted, and Prantl's solution with MgSO_4 omitted. Some of the apogamous embryos developed from cellular masses; others originated as cylindrical outgrowths containing tracheids, from the notch of the prothallia, bearing at their apices cellular masses which gave rise to the leaves, root, and stem of the sporophyte. On one prothallium an apogamous sporophyte formed near the notch, while at its base a lobe of the prothallium

developed, on which in turn occurred an apogamous embryo. In the latter the root developed first. Only three cases of apogamy were observed in *Osmunda Claytoniana* in Prantl's solution with K_2SO_4 omitted. In two cases the sporophytes developed from a mass of cellular tissue, while the third arose as an outgrowth in the notch of the prothallium. A further study will be made of these apogamous forms.—ELIZABETH DOROTHY WUIST, *Osborn Botanical Laboratory, Yale University.*

RAY TRACHEIDS IN QUERCUS ALBA

(WITH ONE FIGURE)

In the course of a recent study of the medullary rays of the Fagaceae, the writer was impressed with the manner in which some of the fibro-tracheids in *Quercus* were associated with the rays. It is very common

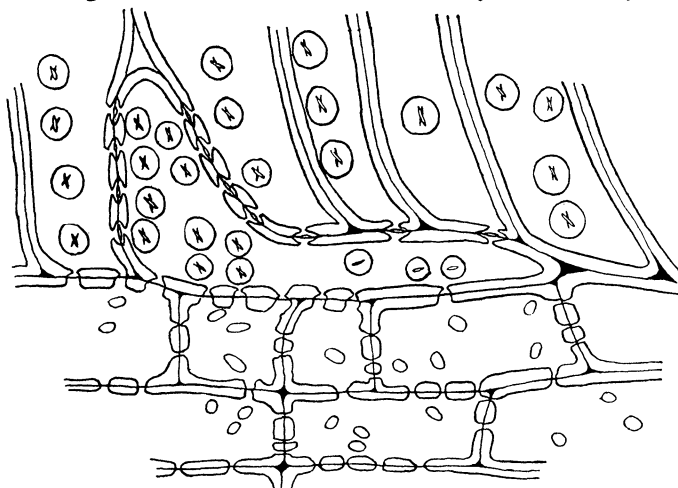


FIG. 1

to find the ends of these elements procumbent on the marginal ray cells for a considerable distance and communicating through semi-bordered pits. This condition is so similar to that found in certain coniferous woods that search was made in sections of oak wood at hand for tracheids that were distinctly radial. Fig. 1 shows a marginal ray tracheid of a uniseriate ray in normal stem wood of *Quercus alba* Linn. Another, somewhat smaller, was found in a different ray in the same section. The location is in the median late wood of the season's growth and is not in immediate proximity to a large vessel. So far as the writer is aware, ray tracheids have not previously been reported in the woods of the dicotyledons.—SAMUEL J. RECORD, *Yale University.*